

## NOTES ON GEOGRAPHIC DISTRIBUTION

### Amphibia, Anura, Cycloramphidae, *Alsodes montanus*: New record and geographic distribution map

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The genus *Alsodes* is the most diversified anuran taxon (18 spp.) inhabiting the southwest of South America (Frost 2008), specifically in central and southern Chile and the southwestern part of Argentina. Sixteen species have been described for Chile, the majority known only from the type locality or from a reduced geographic area (Cuevas and Formas 2005). Most species have been described in the temperate forests south of 35°30' S, but a few are found north of this latitude, in habitats with Mediterranean vegetation (*Alsodes nodosus*) or in mountain streams from the western slopes of the Andes (*A. montanus* and *A. tumultuosus*).

The taxonomy of *A. montanus* is confused due to various nomenclatural changes. Initially described by Philippi (1902) as *Telmatobius montanus*, it was transferred to the genus *Alsodes* by Gallardo (1970), which was supported by other authors based on morphological, chromosome and molecular (isozyme) data (Díaz 1981; Veloso et al. 1982; Díaz 1986). Later, Díaz (1989) defined the genus *Telmalsodes* to include *A. montanus* and the Argentine species *A. pehuenche*, but its validity was rejected by Wiens (1993) and Lavilla (1994) based on morphological evidence. Although most authors currently accept the name *Alsodes montanus* for this taxon (e.g. Cuevas and Formas 2005; Ortiz and Díaz-Páez 2006; Frost 2008), in some recent

reviews of the amphibians of Chile the species is referred to as *Telmalsodes montanus* (Díaz-Páez and Ortiz 2003; Veloso 2006).

Concerning the biogeography of the genus, *A. montanus* is one of three species described from the western slopes of the Andes of central Chile, between 33° and 34° S. The other two species are *A. tumultuosus*, known only from the locality of La Parva (Veloso et al. 1979; Figure 1) and *A. laevis*. The latter has not been collected since it was described by Philippi (1902), which, along with the impossibility of finding the type locality (Ceí 1962), raises serious doubts about its taxonomic validity. Both *A. montanus* and *A. tumultuosus* have been considered endangered species by several authors (Formas 1995; Núñez et al. 1997; Díaz-Páez and Ortiz 2003) and critically endangered by the IUCN (Veloso and Núñez 2004), owing mainly to their reduced distribution areas.

Some sources have indicated that *A. montanus* is only found in the locality of Farellones (IUCN et al. 2006; Veloso 2006; Figure 1), where a decrease in the number of adult individuals and the destruction of their habitat has been documented (IUCN et al. 2006). However, an exhaustive revision of the literature reveals that this species has also been reported from the localities of La Parva (only 3 km from



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Farellones), Estero Covarrubias and Río Clarillo, all located between  $33^{\circ}$  and  $34^{\circ}$  S to the east of the city of Santiago, the capital of Chile (Figure 1). The omission of these localities in most of the literature and the discovery of a new locality described here, also within the latitudinal limits mentioned above, suggest the

need to review the distribution range of this species.

The new locality, Puente Blanco ( $33^{\circ}37'58.9''$  S,  $70^{\circ}19'00.2''$  W, 1455 m), is 32 km south of Farellones and about 30 km southeast of Santiago (Figures 1 and 2).



**Figure 1.** Distribution map of *Alsodes montanus* showing all localities cited in the literature and the new locality, Puente Blanco, described in this report. The question mark represents the locality whose exact location is unknown.

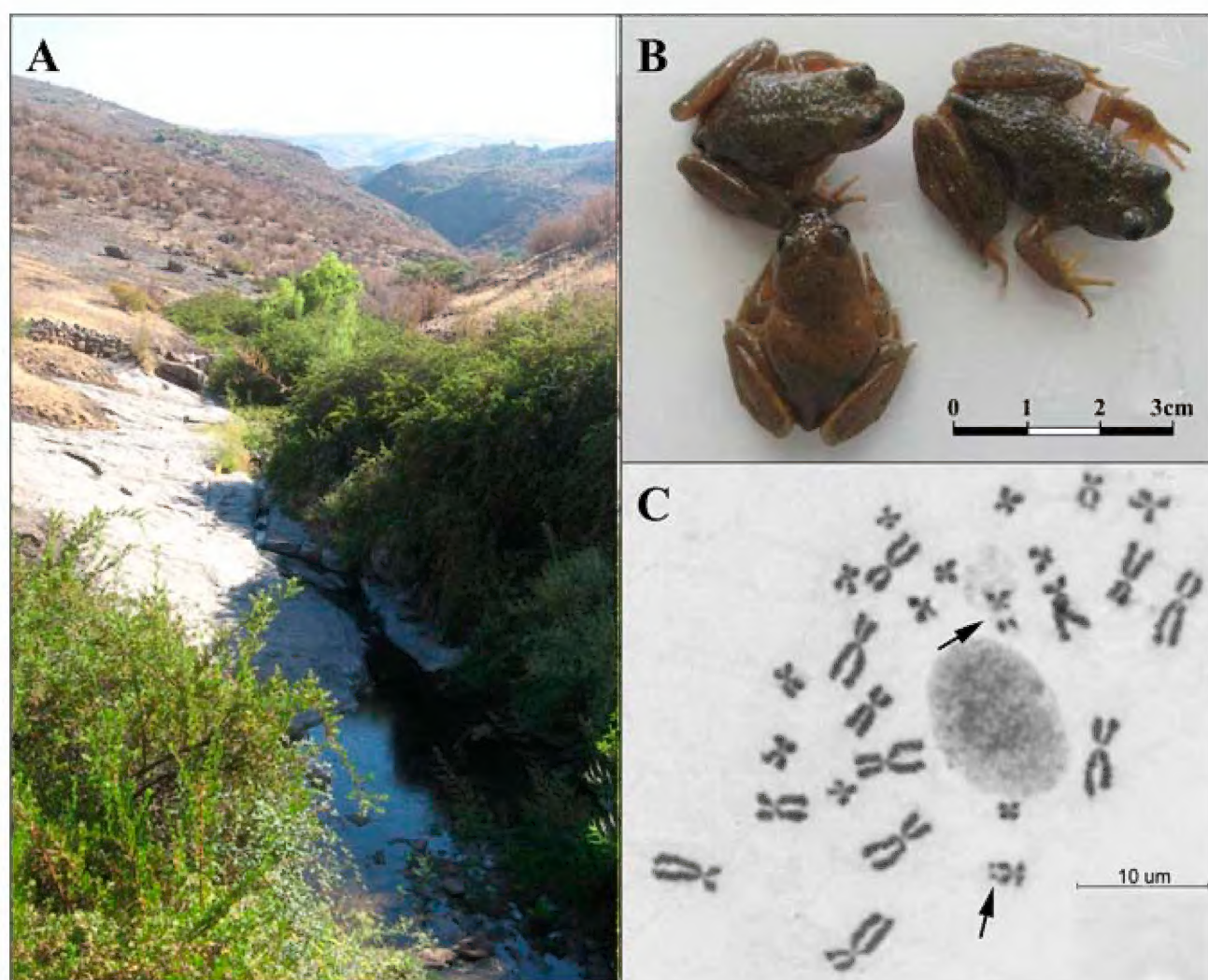


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Three post-metamorphic individuals were collected from this locality on 29 February 2008, from underwater cavities along the edge of a small stream (Figure 2A). These frogs have smooth skin with small granulations; head short, slightly triangular in dorsal view, hind legs palmate and an uniform reddish-brown color without evident spots (Figure 2B). Some of those characteristics were described for *A. montanus* and allow distinguishing it from other congeneric species from central Chile (Ceï 1962; Busse 1980; Veloso et al. 1982). The specimens were deposited in the Herpetological Collection of the *Departamento de Biología Celular y Genética of the Universidad de Chile* (DBGUCH 0802016-0802018). The specific identification was corroborated by a karyotypic analysis, which distinguished *A. montanus* from *A. nodosus* and *A. tumultuosus*. The analysis of individuals 0802016 and 0802017 (Figure 2C) showed a diploid number  $2n=26$ , with a secondary constriction in pair 7, a characteristic described for the karyotype of *A. montanus* (Veloso and Iturra 1979). The diploid number allows to distinguish *A. montanus* from *A. nodosus* ( $2n=22$ ,

Bogart 1970), while the location of the secondary constriction allows to distinguish it from *A. tumultuosus* ( $2n=26$ ), whose NOR is located in pair 2 (Veloso et al. 1979).

The type locality of *A. montanus* is not known exactly: it was reported as “lakes of the Andean region of Santiago” (Philippi 1902; Ceï 1962). Ceï (1962), citing Müller, stated that the species is found from  $32^{\circ}30'$  to  $34^{\circ}20'$  S (central Chile) and mentions two localities, Potrero Grande and Laguna Negra, which as far as we know have not been located with certainty. Other studies, dealing with morphology, natural history, phylogenetic relationships, karyotype and ecological aspects of this species, used or mentioned individuals from Farellones (Veloso and Iturra 1979; Busse 1980; Díaz 1989), La Parva (Busse 1980; Veloso et al. 1982; Díaz and Valencia 1985a; b) and Estero Covarrubias (e.g. Busse 1980; Formas et al. 1997; Cuevas and Formas 2001; 2005). In La Parva the species is sympatric with *A. tumultuosus*, although with some spatial segregation: *A. montanus* was found more frequently at higher elevations (2800–3000 m; Díaz and Valencia 1985a).



**Figure 2.** A: panoramic view of Puente Blanco. B: three post-metamorphic individuals of *Alsodes montanus* from the new locality. C: metaphase plate of *A. montanus* from Puente Blanco (specimen DBGUCH 0802017); arrows show chromosome pair bearing secondary constriction.



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Specimens from Estero Covarrubias were cited in Busse (1980), where the collectors date and collection number were reported, but not the coordinates or the altitude. Other specimen of this locality, IZUA 824, collected at 2400 m, was included among the specimens examined for the description of new species of *Alsodes* (e.g. Formas et al. 1997; Cuevas and Formas 2001; 2005). That altitudinal information was used to indicate the approximate position of this locality in Figure 1. Recently, *A. montanus* was included in the list of vertebrates of the *Reserva Nacional Río Clarillo* (Díaz et al. 2002; Figure 1), found at an altitude of approximately 2000 m. In this case, no individuals were collected (Iván Díaz, comm. pers.), thus it has not been possible to obtain more precise information about the localization of the species along the Clarillo river.

In this framework, the finding of *A. montanus* in Puente Blanco is not only one of the few well-documented records of this species, but also increases considerably its altitudinal range, which was previously described as between 2300 and 3000 m (Formas 1995; Díaz-Páez and Ortiz 2003; IUCN et al. 2006). The presence of the species in this locality, at 1455 m elevation, also increases its known habitat types, since this site is not covered by snow during the entire winter, as is the case for Farellones and La Parva. In La Parva, the extreme environmental conditions and the

presence of *A. tumultuosus* have produced a series of adaptations in habitat use and reproductive strategies in *A. montanus* (Díaz and Valencia 1985a), which may differ considerably in populations of lower altitudes.

At present the known latitudinal extension of the species (33°20' - 33°50' S) is less than that given by Cei (1962), and its distribution is restricted to the drainage system of the Maipo river, since both the Mapocho and Clarillo rivers flow into it (Figure 1). The map also shows that the known populations are divided in three groups presently isolated by the mountains between the Mapocho, Maipo and Clarillo rivers, and by the city of Santiago to the west: La Parva-Farellones-Estero Covarrubias, Puente Blanco and Río Clarillo. The presence of *A. montanus* in several areas of the Maipo drainage, and at a lower altitude than previously reported, raises questions about the distribution limits of this species with respect to *A. nodosus*, which has been described in this drainage system up to an altitude of 1500 m (Veloso and Navarro 1988). In this context, the substantial increase in known altitude range and the difficulty in defining precisely the distribution of *A. montanus*, indicate how little is known about the biogeography of the amphibian fauna of central Chile, one of the regions of the country with highest population density and human intervention.

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